EXHIBIT C

Analysis of Differences in the Neighborhood Characteristics of Pickup and Delivery Locations for Black and White Drivers Employed by DHL at the Lisle, Alsip, and Franklin Park Facilities in the Chicago Region

June 19, 2015

1 Executive Summary

1. I analyzed staffing data and pickup and delivery data for the delivery areas covered by three DHL stations: Lisle (referred to below as DPA), Alsip (referred to below as JOT), and Franklin Park (referred to below as ORD) for the period from 2005-2011. The purpose of my analysis was to determine whether black DHL drivers were more likely than white drivers to drive routes in predominantly black neighborhoods and to drive routes that were "less desirable, more difficult, and/or more dangerous."

2. I analyzed seven characteristics of the stops made by black and white DHL drivers: the percent black of the neighborhood in which the stop took place, the percent of the neighborhood population that was below the poverty line, the percent of the neighborhood that was nonwhite, the rate of violent crimes in the neighborhood, the rate of property crimes in the neighborhood, the likelihood that the neighborhood was more than 50% black, and the likelihood that the neighborhood was more than 70% black. I also analyzed whether the average neighborhood characteristics for all stops on the route for each day for these same seven characteristics differed for black and for white drivers.

3. In performing my analysis, I took account of differences among drivers by seniority, by whether they had casual or regular status, and by the calendar year when they were driving.

4. I used data from the U.S. Census Bureau about race and poverty composition and data compiled by a private company, Location, Inc. about crime rates. I used several different ways to measure neighborhood boundaries with these data, specifically 2010 census tracts, 2010 census block groups, 2010 census approximations to zip

codes, and 2000 census tracts. In general, the answers were very similar regardless of how I measured neighborhood boundaries.

5. In general, black drivers from the JOT station were more likely than white drivers to pick up or deliver packages in neighborhoods that were more black, more nonwhite, poorer, and with higher rates of violent and property crime. Black drivers were also more likely to pick up or deliver packages in neighborhoods that were majority black and that were more than 70% black. These differences were generally highly statistically significant; this pattern was very unlikely to have been caused by chance.

6. Black drivers from the DPA station were generally more likely than white drivers to pick up or deliver packages in neighborhoods that were more black, more nonwhite, poorer, and with higher rates of violent crime than were white drivers. Black drivers were also more likely than white drivers to pick up or deliver packages in neighborhoods that were majority black and that were more than 70% black. These differences were generally statistically significant at more than two standard deviations and were unlikely to have been caused by chance.

7. In January 2009, DHL consolidated pickups and deliveries out of the ORD station. After this date, black drivers from the ORD station were generally more likely than white drivers to pick up or deliver packages in neighborhoods that were more black, more nonwhite, poorer, and with higher rates of violent and property crime than were white drivers. Black drivers were also more likely to pick up or deliver packages in neighborhoods that were majority black and that were more than 70% black. These differences were generally statistically significant at more than two standard deviations and were unlikely to have been caused by chance.

2 Introduction

8. My name is Thomas A. DiPrete. I am the Giddings Professor of Sociology at Columbia University, a faculty member of the Columbia Population Research Center, and the co-director of the Columbia Center for the Study of Wealth and Inequality. My areas of expertise include social stratification, work and labor markets, the demography of the labor force, and the use of statistics in social science research.

9. I was asked by the Equal Employment Opportunity Commission (EEOC) to analyze data provided by DHL to determine whether DHL segregated black drivers in the Chicago area by assigning them more frequently to predominantly black neighborhoods while more frequently assigning white drivers to predominantly white neighborhoods. I was also asked to determine whether DHL assigned black drivers more frequently than white drivers to route assignments that were "less desirable, more difficult, and/or more dangerous." I was asked to particularly focus on three DHL stations in the Chicago area: ORD, JOT, and DPA. I understand that in the period since January 1, 2009, the DHL domestic package delivery service in the Chicago

area was consolidated at the ORD station. Consequently, I separately analyze the pickup and deliveries for ORD before and after January 1, 2009.

10. I understand that the ORD station handled international as well as domestic package delivery. My focus is only on the packages that were delivered to or picked up from stations in the Chicago area, including both Illinois and Indiana. My specific focus was on pickups and deliveries from the three-digit Illinois zip codes 600, 601, 602, 603, 604, 605, 606, 607 and 608, and the three-digit Indiana zip codes 463 and 464.

11. In order to determine whether the EEOC's allegation is true, I was provided with a number of datasets by attorneys for the EEOC, which they obtained from DHL.

12. Information on the staffing assignments of the drivers comes from spreadsheets and annotated printed documents for various times between 2000 and 2012, with the bulk of the records pertaining to the period since 2005. The "Staffing Master File" contained 625,457 records. 391,262 of these records were legible, identifiable records pertaining to a station-route-date-driver combination for stations DPA, JOT, and ORD.[1] Because these data came from multiple sources, many of these records are duplicates. There were 246,334 unique combinations of station, route, date, and driver for the DPA, JOT, and ORD stations.

13. In roughly 3% of these 246,334 records, the data report that more than one driver was driving the same route in the same station on the same day. A close inspection of the data showed many of these "duplicate driver" records were errors in the DHL data. Some of these errors were mistakes by the data entry firm hired by DHL that resulted in the driver and route information being mixed up in the process of transferring data from the spreadsheets to the staffing master file. Sometimes the dates on source documents were not entered accurately. Sometimes the dates on the source documents were not correct in a way where it was possible to establish the correct date from other information on the source document. Sometimes the starting time of a route was incorrectly recorded in the staffing master file as the route number. In about half of the cases, it was possible to correct the "duplicate driver" errors from other information, which reduced the frequency of these duplicates to 1.7% of the 246,334 records in the staffing master file. In many of the remaining cases the duplicate driver situation appeared to arise from DHL including information on both the regular route driver and a different driver who actually drove the route on a particular day to replace the regular driver who may have been absent because of illness, vacation, or injury. In the cases that could not be resolved from other information, I took the paper record whenever possible on the theory that paper records were more likely to record changes made on the day of the drive. Where there were multiple driver records for the same type of document (i.e., paper vs. spreadsheet), I took the driver who less frequently drove that route as the correct

[1] I understand that PLF is an earlier name for DPA, and so I treated these records as part of the records for DPA.

driver for that day on the assumption that the duplication arose from the fact that the regular driver was listed in the data as driving that day even though someone else was the actual driver of the route on that day.

14. Information about the seniority of drivers was compiled by EEOC attorneys from relevant documents obtained from DHL during discovery. I was provided with consolidated seniority rosters for both regular drivers and for casual drivers.

15. The race/ethnic group of DHL drivers was taken from four employee datasets: (1) EEOC v DHL DEF00269428.xls - employees as of 1/1/2008, (2) EEOC v DHL DEF00269429.xls - employees as of 1/1/2009, and (3) EEOC v DHL DEF00009621.xls - ORD employees 8/1/2010+, and (4) an overall listing that was provided on 2/6/13: Copy of Chicago Area employees 2004-2011 with Race or Ethnic Group.xls. The fourth source covered everyone found in the first three sources and some additional drivers as well.

16. Data about the dates, times, routes, and locations of package pickup and delivery came from three sources. The first source contains 25,456,332 records that describe package pickups and deliveries on routes in the DPA, JOT, and ORD stations.[2] There are three types of files in the pickup and delivery database, which are named the "overview," the "note," and the "detail" file. The records in the "detail" database were for pickups and deliveries during the period from 2004 to 2009. Over 96% of the records are for the years 2005-2008.

17. A second source of pickup and delivery information was provided for the consolidated ORD route for the years 2010 and 2011. This second database has 832,732 records.

18. DHL also provided a third source of information in the form of an electronic file that contained pickup and delivery information for the years 2005 through 2009 for the DPA, JOT, and ORD stations. This file provided information about the Airbill number and the station, route, date and time of the pickup or delivery, but the only geographic information on this file was the zip code of the pickup or delivery. This file has information on 55,724,015 distinct pickups or deliveries. In the text below, I refer to this file as the zip code pickup and delivery electronic file or, more succinctly, as the zip code electronic file.

19. The EEOC provided the first two sources of pickup and delivery information to a team of Geographic Information Systems (GIS) experts in the Department of Epidemiology at the Mailman School of Public Health at Columbia University. The GIS team used the information in the "detail" file to geocode the pickup and delivery information in this file. A comprehensive discussion of the geocoding procedure is attached as two appendices to this report, one for the three-station pickup and delivery detail database and one for pickups and deliveries out of the consolidated

[2] About 70,000 records were for the PLF station. I understand that PLF is an earlier name for DPA and so I treated these records as part of the records for DPA.

ORD station after January 1, 2009. These appendices are titled "GIS Code Book: DHL Package Delivery Geocoding Project," and "GIS Code Book: DHL Package Delivery Geocoding Project – Rnd2." The GIS team determined that about 566,000 of the 25.5 million records either did not have valid zip code information or pertained to zip codes outside of the geographic region of interest. These records were dropped from the analysis, which left about 24.8 million records for the geocoding process. The GIS team used information from the address, city and zip code fields in order to geocode the pickup and delivery information in order to match the address information to an XY coordinate location on a map. They used three different methods for locating the addresses; these methods are described in the appendix. They then assigned these addresses to census geographic units, specifically blocks, block groups, and census tracts. Census block groups include an average of 39 census blocks and typically contain between 600 to 3000 people. Census tracts cover contiguous areas that are made up on average of four census block groups and typically have between 1,200 and 8,000 people in them and do not cross county lines. I make use of the geocoded information at the block group and at the census tract geographic level in my analysis.

20. Because the address information in the pickup and delivery "detail" data was not always perfect, the process of assigning addresses to spatial coordinates was not always perfect. The GIS team assigned quality scores to each potential physical location match to a package address. These quality scores describe the confidence registered by the geocoding algorithm about the accuracy of the geocoding. The algorithm used by the GIS team scored 6.7 million of the 25 million addresses with quality scores that were lower than the threshold described on p. 7 of the DHL Project GIS Codebook 04mar2013.pdf, which is attached as an appendix to this report.

21. The GIS team coded the XY coordinates of the pickup and delivery addresses to census geographic units from the 2000 census, the 2010 census, and from the 2006-2010 American Community Surveys (ACS), which are annual surveys of 1% of the American population. They then attached a set of variables from the census and the ACS for these geographic units that I requested. The variables in question provide information about the racial composition of the geographic units, the family and household income in these geographic units, and the ratio of household income to poverty status.

22. Zip codes are groups of addresses that are created by the U.S. Postal Service for efficiency of delivering mail and that can cross county and state boundaries. On average, there are about 7500 people in a zip code. The census approximates zip code geography using zip code tabulation areas (ZCTAs, also referred to here as census zip codes), which are aggregates of census blocks according to the zip code used by a majority of addresses in the block. There are no ZCTAs corresponding to zip codes that correspond to post-office boxes or that contain only a small number of addresses. Both census geographical units and zip codes change over time. The census modifies a subset of its geographical units (including ZCTAs) for each decennial census, while the post-office modifies zip codes on a continual basis. Because of

these modifications over time, and because ZCTAs do not perfectly correspond with zip codes, some of the zip codes in the DHL files will lack corresponding ZCTAs.

23. I added information about the racial composition of census ZCTAs from the 2010 census to the census information provided by the GIS team. I also compared the coverage of 2010 census ZCTAs with the zip codes in the electronic pickup and delivery file that fell within the set of three digit zip codes noted at the start of this report. For station DPA, 366 zip codes in the electronic pickup and delivery file matched 2010 census ZCTAs, while 73 did not match. For station JOT, 343 zip codes in the electronic pickup and delivery file matched 2010 census ZCTAs, while 43 did not match. For station ORD, 361 zip codes in the electronic pickup and delivery file matched 2010 census ZCTAs, while 121 did not match. My analysis of neighborhood racial composition using zip codes to operationalize neighborhoods and using census information on neighborhood racial composition uses the zip codes from the electronic pickup and delivery file that match with the 2010 census zip codes.

24. I signed a license agreement with Location, Inc to obtain information on rates of total crime (number of incidents per 1000 residents), violent crime, and property crime for the relevant geographic region for the years 2006-2012. Location, Inc. tabulated this information by ZCTAs and by 2010 census tracts. I relied on the Location, Inc. crime data for purposes of my analysis and report.

25. There is not a perfect correspondence between the zip codes on the electronic pickup and delivery file and the ZCTAs in the crime file from Location, Inc. For station DPA, 368 zip codes in the electronic pickup and delivery file matched Location, Inc. ZCTAs, while 71 did not match. For station JOT, 344 zip codes in the electronic pickup and delivery file matched ZCTAs, while 42 did not match. For station ORD, 362 zip codes in the electronic pickup and delivery file matched ZCTAs, while 120 did not match. My analysis of neighborhood crime rates using ZCTAs to operationalize neighborhoods and using census information on neighborhood racial composition uses the zip codes from the electronic pickup and delivery file that match with the ZCTAs contained in the Location, Inc. file.

26. At my request, the GIS team attached a set of neighborhood characteristics to the geocoded files that they produced, and they provided this information for three different levels of geographical detail (census block, census block group, and census tract). Depending upon the availability of information from the census, they provide these measures from the 2000 and 2010 census (census block), the 2000 census and the 2006-2010 ACS (census tract and census block group).[3] The particular census products that they used to obtain this information are described in their report, which is attached as an appendix to this report. Not all neighborhood characteristics are available for all geographical levels and for both times.

27. I used the following neighborhood characteristics in my analysis:

[3]The 2006-2010 ACS used 2010 census statistical area definitions.

(a) the percent of residents in the neighborhood who are black;

(b) the percent of residents in the neighborhood who are below the official poverty line;

(c) the percent of residents in the neighborhood who are nonwhite;

(d) the rate of violent crimes per 1000 residents (from Location, Inc.);

(e) the rate of property crimes per 1000 residents (from Location, Inc.).

28. I used the information about the racial composition of census tracts, ZCTAs, and block groups in order to determine whether black drivers were more likely to be picking up and delivering packages in geographic areas with higher concentrations of black and nonwhite residents, higher concentrations of poor residents, and higher crime rates. For each package address in the pickup and delivery file, I merged information about the neighborhood characteristics from the files described above, where "neighborhood" is operationalized variously as census tract, census block group, or zip code (ZCTA) geographic units. I use these measures of package-specific neighborhood information in my analysis. I then created measures of average neighborhood characteristics for all the packages picked up or delivered on any specific date for each route for each station. In addition, I created a third set of measures of route neighborhood characteristics that average the date-specific route neighborhood characteristics across all the dates for which I have pickup and delivery information for these specific routes and stations. I use both package specific location information, and the average for that date and route of neighborhood characteristics at the specific pickup and delivery locations in my analysis.

29. In applying these neighborhood measures to the pickups and delivery locations and to the routes as a whole for the pickup and delivery database that contains detailed address information, I took account of the quality of the geocoded information as reported by the GIS team in the following manner:

(a) I kept track of each stop as measured by a distinct time on the DHL "detail" data (I refer to this distinct time as a "time stop").

(b) I coded each package address according to whether it met the three quality criteria used by the GIS team. Using these quality scores, I determined the maximum quality score available at each time stop. Note that it was possible for distinct packages to have the same time stop in the DHL detail database even though they have different addresses in these data.

(c) I created a subset of the DHL "detail" data that consisted of a maximum of one quality record per address per time stop. If there is no quality record, I kept the record with the highest geoscore. In fewer than 5% of the time stops, a single time stop had more than one address that qualified as a quality address. In these cases, I kept the address that was closest to the previous and the next deliveries when sorted by the time of the pickup or delivery.

(d) As a sensitivity check, I created an additional quality flag that compares the distance in miles between the previous package address and the current package address and between the next package address and the current address, sorted by time stop. It also compares the difference in delivery times between the previous package and the current package, and between the current package and the next package. If either the previous package address or the next package address are scored as quality addresses by the GIS team, I flag geocoded locations as implausible in cases where the distance in miles to the previous or the next package is greater than is the difference in minutes between the pickup/delivery time of the previous or next package and the current package. I then used the combination of the quality measure from the GIS team and my additional quality flag to identify potentially suspect geocoded package locations. For these potentially suspect locations, I created interpolated neighborhood measures that were the average of the neighborhood characteristics of the previous and the next stop as measured by time.

(e) In other words, I analyzed two distinct subsets of records at the level of specific package locations: (a) those locations that met the GIS quality condition, (b) all quality locations plus those nonquality locations where interpolation was possible because of the presence of quality location information for the stop immediately before and immediately after the package pickup or delivery in question.

30. When applying the neighborhood measures to the pickup and delivery records in the zip code electronic file, I retained all records in the file.

31. The staffing master data contains the names of 815 drivers who drove routes from DPA, JOT, or ORD. 285, or 35% of these drivers were black, and 439, or 54% of these drivers were white. Table 1 shows the racial composition of drivers who ever drove out of each of the three stations. The main difference between the three stations is that a higher percentage of the drivers from the JOT station was black (53.5%) than was true for either DPA (33.6%) or ORD (35.4%).[4]

Table 1: Number and Percent of Drivers Ever Driving out of DPA, JOT, and ORD, by Race.

	DPA	JOT	ORD
Black	110 (33.6%)	130 (53.5%)	189 (35.4%)
White	182 (55.7%)	98 (40.3%)	280 (51.9%)
Other	35 (10.7%)	15 (6.2%)	69 (12.8%)
Total	327	243	538

[4] The same driver would sometimes drive out of more than one station, which is why the total count in Table 1 exceeds 815.

32. DHL did not provide information on the seniority of all these drivers. The use of seniority as a control variable in the analysis reduces the number of black and white drivers in the analyses to 639. Supplementary analyses that do not include seniority as a control reveal very similar results to those reported in the tables below.

33. The pickup and delivery of packages was organized into routes by DHL. These routes were designated sometimes by a three digit numeric code and sometimes by a three digit alphanumeric code. There were 553 distinct routes at the DPA station over these years, with 90% of all pickups and deliveries involving a set of 118 routes. There were 238 distinct routes at the JOT station over these years, with 90% of all pickups and deliveries involving a set of 69 routes. There were 805 distinct routes at the ORD station over these years, with 90% of all pickups and deliveries involving a set of 117 routes.

34. During the course of discovery, it was established that the staffing database was not a complete listing of all the route assignments to DHL drivers over the course of their work during the years 2004-2009. It was also established that the pickup and delivery database was not a complete listing of all packages that were picked up or delivered from the DPA, JOT, and ORD stations during the 2004-2009 period. Table 2 shows that the number of days per year that a specific black or white driver shows up in the staffing database varies considerably both across stations and across years. The pattern strongly suggests that many staffing sheets are missing from the staffing sheet database. Table 3 shows a similar table for the number of days per year when there are pickup and deliveries on a route, by year and station, from the pickup and delivery detail database along with the pickup and delivery database for the consolidated ORD route in 2009 and later. While the staffing data seems to imply that routes in ORD are driven on fewer days than in DPA or JOT, Table 3 shows more route-days in ORD than in the other two stations. The data gaps for station JOT are particularly large; there is very little JOT data for 2007 and in the other years there is generally less coverage of the JOT routes in the pickup and delivery data than for stations DPA and ORD. Moreover, a comparison of Tables 2 and 3 shows that the pattern of incomplete data is different for the staffing database and for the pickup and delivery database.

35. As a consequence of missing data in the staffing database and in the pickup and delivery database, there are many instances in which a station-route-date combination from the staffing data does not match with a corresponding combination of station, route, and date from the pickup and delivery data. Similarly, there are many instances in which a station-route-combination from the pickup and delivery data does not match with a corresponding combination of station, route, and date from the staffing data. Of the approximately 10.8 million non-redundant records in the pickup and delivery data, about 52% match with a specific black or white driver on that station, route, and date from the staffing data. The non-matching records will drop from the analysis of package-date-specific neighborhood characteristics and also of route-date-specific neighborhood characteristics. These records will not, however, drop from the analysis of time-invariant route-specific neighborhood characteristics.

Table 2: Average Number of Driving Days for Black and White Drivers, by Year and Station, in the Staffing Data

	DPA	JOT	ORD
2005	16	40	24
2006	83	127	71
2007	146	88	62
2008	126	111	62
2009			52
2010			144
2011			155
2012			81

Table 3: Average Number of Driving Days for Black and White Drivers, by Year and Station, in the Pickup and Delivery Data

	DPA	JOT	ORD
2005	89	47	48
2006	171	121	231
2007	191	3	241
2008	118	75	213
2009			23
2010			214
2011			194

Note: Statistics in Table 3 are based on large routes only (Routes are sorted by number of packages. Large routes are operationalized as those which collectively account for 80% of pickup and delivery records in the pickup and delivery data).

36. It is similarly the case that the zip electronic pickup and delivery file does not match perfectly with the staffing database. Approximately 17.3 million of the 55.8 million records in the zip electronic pickup and delivery file matched with a black or white driver and date from the staffing database. The proportion of matches between the staffing data and the zip electronic pickup and delivery file is lower than with the pickup and delivery "detail" file at least partly because in a large number of the records, the route field has a character code that refers to a specific consignee instead of to the route.

37. The neighborhood characteristics of the three stations are not the same. Table 4 shows the average percent black of census tracts for non-redundant addresses in the

pickup and delivery data. It also shows the percent of packages picked up from or delivered to census tracts that were more than 50% black and that were more than 70% black. As this table makes very clear, the routes from the JOT station were much more likely to be through census tracts that had significant or majority black populations. Only a small minority of package locations for the DPA or ORD stations were in neighborhoods that were majority black.

Table 4: Average Percent Black of 2010 Census Tracts for Package Deliveries in DPA, JOT, and ORD, by Year

Station	Percent Black	Percent >50% black	Percent >70% black
DPA	6.4%	0.3%	0.02%
JOT	32.4%	30.6%	22.6%
ORD before 2009	5.9%	1.7%	1.5%
ORD after 1/1/09	8.9%	4.4%	2.7%

Note: Statistics are based on non-redundant addresses in the DHL pickup and delivery database.

3 Driving Patterns using 2006-2010 ACS Census Tract Geographical Information

38. I next analyzed the extent to which black drivers were assigned to drive different routes than white drivers to an extent not explainable by the station they were driving from or their level of seniority. To accomplish this, I performed a set of analyses that alternately focus on the neighborhood characteristics of each pickup and delivery stop, and that focus on the average characteristics of each stop across that day's route. For each analysis in this section of the report, I measure neighborhood characteristics operationalized as 2010 census tracts.

39. First, I analyzed the neighborhood characteristics of each pickup or delivery associated with a driver and date in the staffing data. I regressed these characteristics on the race of the driver using as control variables the driver's seniority, his status as a casual or regular driver, and the year.[5] The results of this analysis for station DPA

[5]Seniority was specified in seven categories corresponding to seniority numbers in the following range: 1-50, 51-100, 101-250, 251-400, 401-600, 601-700, and greater than 700. One thousand was added to the seniority numbers of casual drivers for those periods of time when this wasn't already the case. The top two seniority categories were combined for the analysis of ORD in 2009 and later. Year was measured as a set of dummy variables for each year. Regular or casual status was measured as a dummy variable. For the regression and logistic regression analyses presented in this report, I report standard errors that are robust to distributional assumptions and to correlated data within groups of observations involving the same driver. Seniority information is missing for some of the DHL drivers, and these drivers are necessarily dropped from the regressions that include seniority as a control. I also estimated models without seniority as a sensitivity analysis and have concluded that the inclusion or exclusion of seniority as a control variable does not have a material impact on the pattern of results.

are in Table 5 and for station JOT are in Table 6. The results for station ORD for 2008 and earlier are in Table 7, and for station ORD for 2009 and later are in Table 8.

Table 5: Analysis of Pickup and Delivery Stop Characteristics for DPA, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.0363*	0.0170*	0.0612*	0.826*	0.229
	(2.37)	(2.12)	(2.33)	(2.44)	(0.12)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	1902068	1902068	1902068	1902068	1902068

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Analysis of Pickup and Delivery Stop Characteristics for JOT, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.355***	0.0926***	0.370***	6.160***	16.48***
	(8.09)	(7.39)	(9.65)	(8.33)	(9.42)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	684918	684918	684918	684918	684918

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Analysis of Pickup and Delivery Stop Characteristics for ORD before 2009, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	-0.00796	0.00711	-0.0195	-0.0250	3.070*
	(-0.62)	(0.89)	(-0.86)	(-0.14)	(2.04)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	1311844	1311844	1311844	1311844	1311844

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Analysis of Pickup and Delivery Stop Characteristics for ORD in or after 2009, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.102**	0.0529**	0.0961*	2.264**	13.50**
	(2.67)	(3.04)	(2.31)	(2.81)	(3.13)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Observations	384390	384390	384390	384390	384390

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

40. Table 5 shows that black drivers in station DPA were significantly more likely than white drivers to deliver or pick up packages in census tracts that had a higher percent of black residents, a higher percent of poor residents, and a higher percent of nonwhite residents. The neighborhoods where they delivered packages also on average had a higher rate of violent crime. Each of these effects was statistically significant at more than two standard deviations. Controlling for other factors, the census tracts for package pickup and delivery had a black density that was 3.6 percentage points higher when the driver was black than when the driver was white, and had a non-white density that was 6.1 percentage points higher when the driver was black

than when the driver was white. The chances that such a pattern would have occurred by chance for each of these outcomes was less than one in twenty.

41. Table 6 shows that there was an especially strong racial disparity in the neighborhoods that white and black drivers went to from the JOT station. Controlling for other factors, the census tracts for package pickup and delivery had a black density that was 35.5 percentage points higher when the driver was black than when the driver was white, and had a poverty density that was 9.3 percentage points higher when the driver was black than when the driver was white. Similarly, the percent non-white of census tracts was higher for black drivers in JOT than for white drivers. Each of these patterns was statistically significant at more than seven standard deviations. The chances that such a pattern would have occurred by chance for each of these outcomes was less than three times in 100 billion.

42. Table 6 also shows that black drivers in the JOT station generally dropped off or picked up packages in census tracts that were more dangerous than were the census tracts for pickups and deliveries driven to by white drivers. On average, black drivers went to census tracts that had over 6 more violent crimes per 1000 residents per year in the years 2006-2012. Furthermore, the census tracts driven to by black drivers had 16.5 more property crimes per 1000 residents per year in this period of time. Both of these effects were statistically significant at more than 8 standard deviations. The chances that such a pattern would have occurred by chance for each of these crime outcomes was less than 2 times in 100 trillion.

43. Table 8 shows that black drivers in station ORD in 2009 or later generally dropped off or picked up packages in census tracts that were poorer and that had higher rates of property crime than were the census tracts for pickups and deliveries driven to by white drivers. On average, black drivers went to census tracts that had 2 more violent crimes and over 13 more property crimes per 1000 residents per year in the years 2006-2012. These discrepancies were statistically significant at more than 2 standard deviations.

44. I next addressed the question whether black drivers in these stations were more likely than white drivers to deliver or pick up packages in a census tract that was majority black or heavily majority black, which I operationalize as 70%. Table 9 shows the results of a logistic regression, where the coefficients are reported in the form of odds ratios. As can be seen in Table 9, the odds that a black driver from the DPA station would deliver or pick up a package in a census tract that was more than 50% black were over nine times as high as were the corresponding odds for a white driver, after year, seniority, and regular or casual status were taken into account. This difference was statistically significant at more than 2 standard deviations. The odds that a black driver from the JOT station would deliver or pick up a package in a census tract that was more than 50% black were over six times as high as were the corresponding odds for a white driver, and this difference was statistically significant at more than 5 standard deviations. The odds that this difference would be a consequence of chance are less than 6 times in a billion. Table 9 further

shows that there was no statistically significant difference in the odds of a white or black driver in the ORD station before 2009 delivering or picking up a package in a census tract that was majority black before 2009, but after 2009, black drivers had over six times higher odds than white drivers of delivering a package to a census tract that was more than 50% black, and this discrepancy was statistically significant at more than 3 standard deviations.

Table 9: Probability of Stops in 50+ Percent Black Neighborhoods, 2010 Census Tracts

	(1) DPA	(2) JOT	(3) ORD pre-2009	(4) ORD 2009+
Black Driver	9.565*	6.883***	0.719	6.723***
	(2.23)	(5.82)	(-0.49)	(3.65)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	1901125	685524	1322458	385117

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

45. Table 10 shows, for each of the three stations, the odds ratios of a black vs a white driver delivering or picking up a package in a census tract that is more than 70% black, after taking seniority, casual or regular status, and year into account. The odds that a black driver at the DPA station would deliver or pick up a package in a heavily (70% or more) black neighborhood were 42.8 times as high as for a white driver. This difference was statistically significant at more than 3 standard deviations, and would have been produced by chance only 16 times out of a 100,000 tries. The odds that a black driver at the JOT station would deliver or pick up a package in a heavily (70% or more) black neighborhood were 10.9 times as high as for a white driver. This difference was statistically significant at more than 7 standard deviations, and would have been produced by chance only 5 times out of 10 trillion tries. The odds that a black driver at the ORD station in 2009 or later would deliver or pick up a package in a heavily (70% or more) black neighborhood were 7.8 times as high as for a white driver. This difference was statistically significant at more than 3 standard deviations.

Table 10: Probability of Stops in 70+ percent black neighborhoods, 2010 Census Tracts

	(1) DPA	(2) JOT	(3) ORD pre-2009	(4) ORD 2009+
Black Driver	42.72***	10.94***	0.686	7.840***
	(3.77)	(7.22)	(-0.53)	(3.84)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	1901125	685524	1322458	385117

Exponentiated coefficients; *t* statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

46. Each of the above analyses used the package address as the unit of analysis. An alternative strategy focuses on the average neighborhood characteristics of the entire route on each day, using census tracts as the operationalization of neighborhood. Tables 11, 12, and 13 show the results of regressions of average route neighborhood characteristics on the race of the driver, where 2010 census tract is used to operationalize neighborhood and where seniority, regular or casual status, and year are controlled. Table 11 shows the results for the DPA station. The average route driven by a black driver out of the DPA station was 2.4 percentage points more black than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account. This difference was statistically significant at over 2 standard deviations. The average route driven by a black driver out of the DPA station had a poor population that was 1.4 percentage higher than for a white driver. This difference was also statistically significant at over 2 standard deviations. The average route driven by a black driver out of the DPA station had a nonwhite population that was 5.0 percentage higher than for a white driver. This difference was statistically significant at over 2 standard deviations. Black drivers in the DPA station were also more likely than white drivers to drive routes with higher average violent crime rates, with the difference being statistically significant at over two standard deviations.

Table 11: Analysis of Route-Day Characteristics for DPA, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.0242*	0.0144*	0.0495**	0.576*	0.0130
	(2.13)	(2.41)	(2.63)	(2.43)	(0.01)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	43526	43526	43526	43526	43526

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

47. As can be seen in Table 12, the average route driven by a black driver out of the JOT station was 32.1 percentage points more black than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account. This difference was statistically significant at over 8 standard deviations. The average route driven by a black driver out of the JOT station had a poor population that was 9 percentage points higher than for a white driver. This difference was statistically significant at over 7 standard deviations. The average route driven by a black driver out of the JOT station had a nonwhite population that was 33.6 percentage higher than for a white driver. This difference was statistically significant at over 9 standard deviations. Black drivers in the JOT station were also more likely than white drivers to drive routes with higher average violent crime rates, with the difference being statistically significant at over 8 standard deviations, and they were more likely to drive routes with higher property crimes than whites, with the difference being statistically significant at over 9 standard deviations.

Table 12: Analysis of Route-Day Characteristics for JOT, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.321***	0.0899***	0.336***	5.692***	15.54***
	(8.30)	(7.37)	(9.51)	(8.76)	(9.86)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	13619	13619	13619	13619	13619

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

48. Thirdly, I examined the differences in the average neighborhood characteristics of routes driven by black and white drivers in the ORD station. As can be seen in Table 13, the average route driven by a black driver out of the ORD station before 2009 was 4.2 percentage points less nonwhite than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account and this difference was statistically significant at the 2 standard deviation level. Table 14, however, shows that in or after 2009, the routes driven by black drivers were 11.1 percentage points more black, 5.6 percentage points more poor, and 10.8 percentage points more nonwhite than were the routes driven by white drivers. The routes driven by black drivers also had 2 more violent crimes per thousand and 13.3 more property crimes per thousand. Each of these discrepancies was statistically significant at more than 3 standard deviations.

Table 13: Analysis of Route-Day Characteristics for ORD before 2009, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	-0.0116	0.00367	-0.0418*	-0.130	2.013
	(-1.01)	(0.53)	(-2.00)	(-0.82)	(1.48)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	41887	41887	41887	41887	41887

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Analysis of Route-Day Characteristics for ORD in or after 2009, 2010 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.111**	0.0560***	0.108**	2.278***	13.31***
	(3.16)	(3.90)	(3.11)	(3.48)	(3.94)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Observations	22828	22828	22828	22828	22828

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

49. Next, I examined the probability of a black or white driver driving a route that over the course of the day was on average either more than 50% black or more than 70% black. Because majority black census tracts were rare in both station DPA and station ORD, I only report logistic regression results for the JOT station. Table 15 shows the results from these analyses. As can be seen from Table 15, the odds that a black driver would deliver or pickup packages on a JOT route that on average were in 50% or higher black neighborhoods were 8.5 times as high as for a white driver. This difference was statistically significant at more than 5 standard deviations, which would occur by chance fewer than six times in 100 million. The odds

that a black driver would deliver or pickup packages on a JOT route that on average were in 70% or higher black neighborhoods were 17 times as high as for a white driver. This difference was statistically significant at more than 6 standard deviations, which would occur by chance fewer than two times in 10 billion.

Table 15: Probability of Route Stops being on Average in Majority Black Neighborhoods in Station JOT, 2010 Census Tracts

	(1) >=50%	(2) >=70%
Black Driver	8.503***	17.15***
	(5.43)	(6.40)
Year	Yes	Yes
Seniority	Yes	Yes
Regular/Casual	Yes	Yes
Observations	13626	13626

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means that the indicated variable was included in the model.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

50. Lastly, as a robustness check on my analysis of average route characteristics, I recomputed these average characteristics quality measures when available as before but now also using interpolated geography measures when plausible interpolations were obtainable. The results of these analyses are in Tables 16, 17, 18, and 19. As is readily apparent, the coefficients in the regressions that also include interpolated neighborhood data for non-quality locations are very similar to the coefficients presented in Tables 11, 12, 13, and 14 for the regressions that only analyze data for quality locations.

Table 16: Analysis of Route-Day Characteristics for DPA, 2010 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.0243*	0.0142*	0.0495**	0.578*	0.0265
	(2.13)	(2.40)	(2.62)	(2.43)	(0.02)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	43526	43526	43526	43526	43526

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17: Analysis of Route-Day Characteristics for JOT, 2010 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.321***	0.0901***	0.336***	5.700***	15.57***
	(8.31)	(7.37)	(9.53)	(8.78)	(9.88)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	13619	13619	13619	13619	13619

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18: Analysis of Route-Day Characteristics for ORD before 2009, 2010 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	-0.0117	0.00384	-0.0411*	-0.126	1.974
	(-1.03)	(0.55)	(-2.00)	(-0.80)	(1.45)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes	Yes
Observations	41889	41889	41889	41889	41889

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19: Analysis of Route-Day Characteristics for ORD in or after 2009, 2010 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White	(4) Violent Crime	(5) Property Crime
Black Driver	0.111**	0.0560***	0.108**	2.270***	13.38***
	(3.16)	(3.90)	(3.12)	(3.48)	(3.90)
Year	Yes	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes	Yes
Observations	22828	22828	22828	22828	22828

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Driving Patterns Using 2006-2010 ACS Block Group Geographical Information

51. The analyses in the previous section use neighborhood characteristics of each pickup and delivery location measured using 2006-2010 ACS census tract geographical information along with neighborhood crime characteristics from Location, Inc. I next

performed a set of parallel analyses in which the neighborhood characteristics are measured using 2006-2010 ACS census block group geographical information. These analyses closely parallel the 2006-2010 ACS census tract analyses, with the exception of omitting the neighborhood crime characteristics from Location, Inc, because Location, Inc. did not provide crime measures at the census block group level.

52. First, I analyzed the extent to which black drivers were assigned to drive different routes than white drivers to an extent not explainable by their station, year, status as a regular or causal driver, or their level of seniority. I attached the 2010 census block group characteristics to each pickup or delivery associated with a driver and date in the staffing data. I then regressed these characteristics on the race of the driver using as control variables the driver's seniority, his status as a casual or regular drivers, and the year, as described in section 3. The results of this analysis for station DPA are in Table 20, for station JOT are in Table 21, for station ORD before 2009 are in Table 22, and for station ORD in 2009 and later are in Table 23.

Table 20: Analysis of Pickup and Delivery Stop Characteristics for DPA, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0478**	0.0203*	0.0693*
	(2.76)	(2.05)	(2.52)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	1902068	1902068	1902068

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

53. Table 20 shows that black drivers out of location DPA were significantly more likely than white drivers to deliver or pick up packages in census block groups that had a higher percent of black residents, a higher percent of poor residents, and a higher percent of nonwhite residents. Each of these effects was statistically significant at more than two standard deviations. Controlling for other factors, the census block groups for package pickup and delivery had a black density that was 4.8 percentage points higher when the driver was black than when the driver was white, and had a poverty density that was 2.0 percentage points higher when the driver was black than when the driver was white. The chances that such a pattern would have occurred by chance for each of these outcomes was less than one in twenty.

Table 21: Analysis of Pickup and Delivery Stop Characteristics for JOT, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.354***	0.0960***	0.373***
	(8.19)	(7.47)	(10.00)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	684918	684918	684918

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

54. Table 21 shows that there was an especially strong racial disparity in the neighborhoods that white and black drivers went to from the JOT station. Controlling for other factors, the census block groups for package pickup and delivery had a black density that was 35.4 percentage points higher when the driver was black than when the driver was white, and had a poverty density that was 9.6 percentage points higher when the driver was black than when the driver was white. Similarly, the percent non-white of census block groups was higher for black drivers in JOT than for white drivers. Each of these patterns was statistically significant at more than seven standard deviations. The chances that such a pattern would have occurred by chance for each of these outcomes was less than three times in 100 billion.

Table 22: Analysis of Pickup and Delivery Stop Characteristics for ORD before 2009, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	-0.00738	-0.0106	-0.0240
	(-0.58)	(-0.78)	(-0.91)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	1311844	1311844	1311844

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

55. Table 22 shows that the differences in block group race and poverty characteristics of pickup and delivery locations driven by black and by white drivers in the ORD station before 2009 were not different at a statistically significant level. In 2009 or after, however, as seen in Table 23, black drivers dropped off and picked up packages in block groups that were 9.4 percentage points more black, 5.2 percentage points higher poverty, and 9.2 percentage points more non-white than did white drivers.

Table 23: Analysis of Pickup and Delivery Stop Characteristics for ORD in or after 2009, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0936*	0.0518*	0.0924*
	(2.51)	(2.52)	(2.30)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Observations	384381	384381	384381

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

56. I next addressed the question whether black drivers in these stations were more likely than white drivers to deliver or pick up packages in a census block group that

was majority black or heavily majority black. Table 24 shows the results of a logistic regression, where the coefficients are reported in the form of odds ratios. As can be seen in Table 24, the odds that a black driver from the DPA station would deliver or pick up a package in a census block group that was more than 50% black were over seven times as high as were the corresponding odds for a white driver, after year, seniority, and regular or casual status were taken into account. This difference was statistically significant at more than 2 standard deviations. The odds that a black driver from the JOT station would deliver or pick up a package in a census block group that was more than 50% black were also over seven times as high as were the corresponding odds for a white driver, and this difference was statistically significant at 6 standard deviations. The odds that this difference would be a consequence of chance are less than 2 times in a billion. Table 24 further shows that there was no statistically significant difference in the odds of a white or black driver in the ORD station before 2009 delivering or picking up a package in a census block group that was majority black. In 2009 or after, however, a black driver had almost 6 times the odds of a white driver of picking up or delivering a package in a block group that was majority black. This discrepancy is statistically significant at more than 3 standard deviations.

Table 24: Probability of Stops being in 50+ percent black neighborhoods, 2010 Census Block Groups

	(1) DPA	(2) JOT	(3) ORD pre-2009	(4) ORD 2009+
Black Driver	7.739*	7.356***	0.676	5.979***
	(2.28)	(6.00)	(-0.68)	(3.62)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	1901125	685524	1322458	385117

Exponentiated coefficients; *t* statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

57. Table 25 shows, for each of the three stations, the odds ratios of a black vs a white driver delivering or picking up a package in a census block group that is more than 70% black, after taking seniority, casual or regular status, and year into account. The odds that a black driver at the DPA station would deliver or pick up a package in a heavily (70% or more) black neighborhood were 37.1 times as high as for

a white driver. This difference was statistically significant at more than 5 standard deviations, and would have been produced by chance only 3 times out of 10 million tries. The odds that a black driver at the JOT station would deliver or pick up a package in a heavily (70% or more) black neighborhood were 9.5 times as high as for a white driver. This difference was statistically significant at more than 6 standard deviations, and would have been produced by chance only 7 times out of one trillion tries. There was no statistically significant difference in the odds of a white or black driver in the ORD station before 2009 of delivering or picking up a package in a census block group that was 70% or more black. In 2009 or after, however, a black driver had over 8 times the odds of a white driver of picking up or delivering a package in a block group that was majority black. This discrepancy is statistically significant at more than 3 standard deviations.

Table 25: Probability of Stops in 70+ percent black neighborhoods, 2010 Census Block Groups

	(1) DPA	(2) JOT	(3) ORD pre-2009	(4) ORD 2009+
Black Driver	37.05***	9.475***	0.517	8.101***
	(5.15)	(6.85)	(-1.05)	(3.85)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	1901125	685524	1322458	385117

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

58. Each of the above analyses used the package address as the unit of analysis and the block group as the measure of neighborhood geography. An alternative strategy focuses on the average neighborhood characteristics of the entire route on each day. Tables 26, 27, and 28 show the results of regressions of average route neighborhood characteristics on the race of the driver, where 2010 census block groups are used to operationalize neighborhood and where seniority, regular or casual status, and year are controlled. Table 26 shows the results for the DPA station. The average route driven by a black driver out of the DPA station was 3.5 percentage points more black than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account. This difference was statistically significant at over 2 standard deviations. The average route driven by a black driver

out of the DPA station had a poor population that was 1.6 percentage higher than for a white driver. This difference was also statistically significant at over 2 standard deviations. The average route driven by a black driver out of the DPA station had a nonwhite population that was 5.8 percentage higher than for a white driver. This difference was also statistically significant at over 2 standard deviations.

Table 26: Analysis of Route-Day Characteristics for DPA, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0350**	0.0161*	0.0579**
	(2.73)	(2.15)	(2.98)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	43526	43526	43526

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

59. As can be seen in Table 27, the average route driven by a black driver out of the JOT station was 31.9 percentage points more black than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account. This difference was statistically significant at over 8 standard deviations. The average route driven by a black driver out of the JOT station had a poor population that was 9.45 percentage points higher than for a white driver. This difference was also statistically significant at over 7 standard deviations. The average route driven by a black driver out of the JOT station had a nonwhite population that was 33.6 percentage points higher than for a white driver. This difference was statistically significant at over 9 standard deviations.

Table 27: Analysis of Route-Day Characteristics for JOT, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.319***	0.0945***	0.336***
	(8.39)	(7.60)	(9.73)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	13619	13619	13619

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

60. Thirdly, I examined the differences in the average neighborhood characteristics of routes driven by black and white drivers in the ORD station. As can be seen in Table 28, differences in the average neighborhood race and poverty characteristics of routes driven by black and white drivers in the ORD station were not statistically significant when 2010 census block groups are used to operationalize neighborhood geography. However, as seen in Table 29, black drivers drove routes in ORD in 2009 or later that were 10.2 percentage points more black with 5.7 percentage points higher poverty rates and that were 10.2 percentage points more non-white. Each of these discrepancies was statistically significant at more than 2 standard deviations.

Table 28: Analysis of Route-Day Characteristics for ORD before 2009, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	-0.0104	-0.0134	-0.0477
	(-0.93)	(-0.97)	(-1.86)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	41887	41887	41887

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 29: Analysis of Route-Day Characteristics for ORD in or after 2009, 2010 Census Block Groups

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.102**	0.0571***	0.102**
	(2.91)	(3.45)	(3.02)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Observations	22828	22828	22828

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

61. Next, I examined the probability of a black or white driver driving a route that over the course of the day was on average either more than 50% black or more than 70% black when 2010 census block groups are used to operationalize neighborhoods. Because majority black census block groups were rare in both station DPA and station ORD, I only report logistic regression results for the JOT station. Table 30 shows the results from these analyses. Black drivers were 8.5 times as likely (in terms of odds) than white drivers to drive a route at the JOT station that on average was more than 50% black, and black drivers were 12.9 times as likely as white drivers to drive a route at the JOT station that was more than 70% black. Both of these differences were statistically significant at over 5 standard deviations.

Table 30: Probability of Route Stops being on Average in Majority and 70+ Percent Black Neighborhoods in Station JOT, 2010 Census Block Groups

	(1) >=50%	(2) >=70%
Black Driver	8.468***	12.86***
	(5.26)	(5.56)
Year	Yes	Yes
Seniority	Yes	Yes
Regular/Casual	Yes	Yes
Observations	13626	13626

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means that the indicated variable was included in the model.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

62. Lastly, I included interpolated geography measures for those pickup or delivery addresses that did not meet the quality threshold but had plausible interpolated neighborhood characteristics based on the presence of quality addresses before or after them in the time order of package deliveries and pickups. A comparison of Tables 31, 32, and 33 with Tables 26, 27, and 28 shows that the addition of interpolated measures for the computation of average neighborhood characteristics of routes makes very little difference in the estimated differences between the experiences of black and white drivers, and it has very little impact on the statistical significance of the racial differences that were reported above.

Table 31: Analysis of Route-Day Characteristics for DPA, 2010 Census Block Groups, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0352**	0.0160*	0.0574**
	(2.73)	(2.14)	(2.95)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	43526	43526	43526

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 32: Analysis of Route-Day Characteristics for JOT, 2010 Census Block Groups, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.320***	0.0946***	0.337***
	(8.41)	(7.59)	(9.75)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	13619	13619	13619

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 33: Analysis of Route-Day Characteristics for ORD before 2009, 2010 Census Block Groups, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	-0.0110	-0.0130	-0.0470
	(-0.98)	(-0.95)	(-1.86)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	41889	41889	41889

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 34: Analysis of Route-Day Characteristics for ORD in or after 2009, 2010 Census Block Groups, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.102**	0.0573***	0.102**
	(2.91)	(3.47)	(3.03)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Observations	22828	22828	22828

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Driving Patterns using 2010 Census Zip Code Tabulation Area Geographical Information

63. In this section of my report, I discuss the results from a set of parallel analyses in which the neighborhood characteristics are measured using racial information from the 2010 census organized by zip code tabulation area (ZCTA) geography (also referred to below as census zip codes). This set of analyses is based on the electronic pickup and delivery file that contains only zip code information about the package

locations, and so I do not report a robustness check using interpolated address information for this set of analyses. For analyses of neighborhood crime characteristics, I use data from Location, Inc. reported for zip code geography. I omit analysis of the poverty characteristics of census zip codes because this information was not available from the 2010 census.

64. First, I analyzed the neighborhood characteristics of each pickup or delivery associated with a driver and date in the staffing data. I regressed these characteristics on the race of the driver using as control variables the driver's seniority, his status as a casual or regular drivers, and the year. The results of this analysis for station DPA are in Table 35, for station JOT are in Table 36, for station ORD before 2009 are in Table 37, and for station ORD in 2009 and later are in Table 38.

Table 35: Analysis of Pickup and Delivery Stop Characteristics for DPA, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	0.0216	0.0413	0.268	-1.666
	(1.68)	(1.93)	(1.59)	(-1.31)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes
Observations	8702248	8702248	8702248	8702248

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

65. Table 35 shows that differences in the racial, poverty, or crime characteristics of the census zip codes of pickup and delivery locations driven to by black and white drivers in station DPA were not statistically significant.

Table 36: Analysis of Pickup and Delivery Stop Characteristics for JOT, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	0.273***	0.283***	5.042***	12.55***
	(6.50)	(7.68)	(7.12)	(7.32)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes
Observations	2383714	2383714	2383714	2383714

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

66. Table 36 shows that there was an especially strong racial disparity in the neighborhoods that white and black drivers went to from the JOT station. Controlling for other factors, the census zip codes for package pickup and delivery had a black density that was 27.3 percentage points higher when the driver was black than when the driver was white. Similarly, the percent non-white of census zip codes was higher for black drivers in JOT than for white drivers. The discrepancy in percent black is statistically significant at more than 6 standard deviations, while the discrepancy in percent non-white is statistically significant at more than 7 standard deviations.

67. Table 36 also shows that black drivers in the JOT station generally dropped off or picked up packages in census zip codes that were more dangerous than were the census zip codes for pickup and delivery visited by white drivers. On average, black drivers went to census zip codes that had over 5 more violent crimes per 1000 residents per year in the years 2006-2012. Furthermore, the neighborhoods driven to by black drivers had 12.6 more property crimes per 1000 residents per year in this period of time than did the neighborhoods driven to by white drivers. Both of these effects were statistically significant at more than 7 standard deviations. The chances that such a pattern would have occurred by chance for each of these crime outcomes was less than 3 times in a trillion.

Table 37: Analysis of Pickup and Delivery Stop Characteristics for ORD before 2009, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	-0.000625	0.0185	0.0615	1.504
	(-0.08)	(1.26)	(0.42)	(1.69)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes
Observations	5480411	5480411	5480411	5480411

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 38: Analysis of Pickup and Delivery Stop Characteristics for ORD in 2009 or later, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	0.104*	0.121**	2.796**	13.44***
	(2.42)	(2.94)	(2.98)	(3.63)
Seniority	Yes	Yes	Yes	Yes
Observations	84766	84766	84766	84766

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

68. Table 37 shows no statistically significant differences in the characteristics of pickup and delivery locations for black and white drivers in the ORD station before 2009 when census zip codes are used to measure neighborhoods. However, in the 2009 or later period, as can be seen in Table 38, black drivers in the ORD station picked up or delivered packages in census zip codes that were 10.4 percentage points more black, and 12.1 percentage points more non-white. These neighborhoods on average had 2.8 more violent crimes per 1000 residents, and had 13.4 more property crimes per 1000 residents. All of these discrepancies were statistically significant at more than 2 standard deviations.

69. I next addressed the question whether black drivers in these stations were more likely than white drivers to deliver or pick up packages in a census zip code that was

majority black or heavily majority black. Table 39 shows the results of a logistic regression, where the coefficients are reported in the form of odds ratios. As can be seen in Table 39, the odds that a black driver from the JOT station would deliver or pick up a package in a census zip code that was more than 50% black were over eight times as high as were the corresponding odds for a white driver, and this difference was statistically significant at more than 4 standard deviations. Table 39 further shows that there was no statistically significant difference in the odds of a white or black driver delivering of picking up a package in a census zip code that was majority black at either the DPA or the ORD stations before 2008. However, black drivers in the ORD station in 2009 or later had odds of stopping in a majority black zip code that were more than 6 times as high as the odds for a white driver, and this difference was statistically significant at more than 2 standard deviations.

Table 39: Probability of Stops being in 50+ percent black neighborhoods, 2010 Census Zip Code Tabulation Areas

	(1) DPA	(2) JOT	(3) ORD <=2008	(4) ORD 2009+
Black Driver	1.254	8.219***	0.395	6.406**
	(0.81)	(4.57)	(-1.23)	(2.61)
Year	Yes	Yes	Yes	No
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	8702248	2383714	5480411	84766

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

70. Table 40 shows, for each of the three stations, the odds ratios of a black vs a white driver delivering or picking up a package in a census zip code that is more than 70% black, after taking seniority, casual or regular status, and year into account. The odds that a black driver at the JOT station would deliver or pick up a package in a heavily (70% or more) black zip code were 7.35 times as high as for a white driver. This difference was statistically significant at more than 4 standard deviations. The odds that a black driver at the DPA or the ORD station would deliver or pickup a package from a heavily black zip code in DPA or ORD before 2009 were not statistically different than the odds for a white driver, but in 2009 or after, a black driver at ORD had over 9 times the odds of a white driver of stopping in a census zip code that was 70 or more percent black. This discrepancy was statistically significant at more than three standard deviations.

Table 40: Probability of Stops in 70+ percent black neighborhoods, 2010 Census Zip Code Tabulation Areas

	(1) DPA	(2) JOT	(3) ORD <=2008	(4) ORD 2009+
Black Driver	1.423	7.353***	0.393	9.758**
	(1.39)	(4.04)	(-1.23)	(3.07)
Year	Yes	Yes	Yes	No
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	8702248	2383714	5480411	84766

Exponentiated coefficients; *t* statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

71. Each of the above analyses used the package address as the unit of analysis. An alternative strategy focuses on the average characteristics of the entire route on each day. Tables 41, 42, 43, and 44 show the results of regressions of average route neighborhood characteristics on the race of the driver, where 2010 census zip codes are used to operationalize neighborhood and where seniority, regular or casual status, and year are controlled. Table 41 shows the results for the DPA station. The average route driven by a black driver out of the DPA station was 2.6 percentage points more black than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account. This difference was statistically significant at over 2 standard deviations. The average route driven by a black driver out of the DPA station had a nonwhite population that was 4.7 percentage points higher than for a white driver. This difference was statistically significant at over 2 standard deviations.

Table 41: Analysis of Route-Day Characteristics for DPA, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	0.0257*	0.0470**	0.321	-0.547
	(2.40)	(2.68)	(1.85)	(-0.50)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes
Observations	57940	57940	57940	57940

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 42: Analysis of Route-Day Characteristics for JOT, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	0.320***	0.331***	6.040***	15.32***
	(8.79)	(9.86)	(8.65)	(10.19)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes
Observations	22878	22878	22878	22878

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

72. As can be seen in Table 42, the average route driven by a black driver out of the JOT station was 32 percentage points more black than was the average route driven by a white driver after taking seniority, casual or regular status, and year into account. This difference was statistically significant at over 8 standard deviations. The average route driven by a black driver out of the JOT station had a nonwhite population that was 33.1 percentage higher than for a white driver. This difference was statistically significant at over 9 standard deviations. The average zip code characteristics of routes driven by black drivers at JOT had 6 more violent crimes per

1000 resident and 15.3 more property crimes per 1000 residents than did the routes driven by white drivers at JOT. These differences are statistically significant at over 8 and over 10 standard deviations, respectively. As can be seen in Tables 43 and 44, there was no statistically significant difference in the neighborhood characteristics of routes for black and white drivers in ORD before 2009, but in 2009 or later, black drivers drive routes that were 13.3 percentage points more black, 13.8 percentage points more nonwhite, and that had 2.8 more violent crimes per thousand people and 12.4 more property crimes per thousand people. All these differences were statistically significant are more than 3 standard deviations.

Table 43: Analysis of Route-Day Characteristics for ORD before 2009, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	-0.00241	0.00152	0.0163	0.884
	(-0.22)	(0.10)	(0.13)	(0.97)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	Yes
Observations	48172	48172	48172	48172

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 44: Analysis of Route-Day Characteristics for ORD in 2009 or later, 2010 Census Zip Code Tabulation Areas

	(1) Percent Black	(2) Percent Non-White	(3) Violent Crime	(4) Property Crime
Black Driver	0.133***	0.138***	2.780***	12.36***
	(3.50)	(3.93)	(3.68)	(3.98)
Seniority	Yes	Yes	Yes	Yes
Observations	2809	2809	2809	2809

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

73. Lastly, I examined the probability of a black or white driver driving a route that over the course of the day was on average either more than 50% black or more than 70% black. Because majority black census zip codes were rare in both station DPA and station ORD, I only report logistic regression results for the JOT station. Table 45 shows the results from these analyses. The odds that the average zip code for pickups and deliveries on a route was more than 50% black were more than 8 times as high for a black driver than for a white driver at the JOT station. The odds that the average zip code for pickups and deliveries on a route was more than 70% black were more than 13 times as high for a black driver than for a white driver at the JOT station. These differences were statistically significant at more than 5 and more than 4 standard deviations, respectively.

Table 45: Probability of Route Stops being in on Average Majority Black Neighborhoods in Station JOT, 2010 Census Zip Code Tabulation Areas

	(1) >=50%	(2) >=70%
Black Driver	8.591***	13.75***
	(5.16)	(4.75)
Year	Yes	Yes
Seniority	Yes	Yes
Regular/Casual	Yes	Yes
Observations	22878	22878

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Driving Patterns using 2000 Census Tract Geographical Information

74. In this section of my report, I again use census tracts as the geographic unit, but here I use neighborhood characteristics obtained from the 2000 census using 2000 census tract geography. For this analysis, I omit neighborhood crime characteristics, as these are only available from Location, Inc. for 2010 geography.

75. I analyzed the neighborhood characteristics of each pickup or delivery associated with a driver and date in the staffing data. I regressed these characteristics on the race of the driver using as control variables the driver's seniority, his status as a casual or regular driver, and the year. The results of this analysis for station DPA are

in Table 46, for station JOT are in Table 47, in station ORD for the period before 2009 are in Table 48, and for ORD for 2009 or later are in Table 49. A comparison of Tables 5 and 46 shows the results for station DPA to be very similar regardless of which geography is used. A comparison of Tables 6 and 47 for station JOT, Tables 7 and 48 for station ORD before 2009, and 8 and 49 for ORD in 2009 or later shows that the results are substantially the same for these other two stations regardless of whether 2000 census tract neighborhood characteristics or 2006-2010 census tract neighborhood characteristics are used to characterize neighborhoods.

Table 46: Analysis of Pickup and Delivery Stop Characteristics for DPA, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0449**	0.0121*	0.0633**
	(2.91)	(2.06)	(3.12)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	1902067	1902067	1902067

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 47: Analysis of Pickup and Delivery Stop Characteristics for JOT, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.351***	0.0767***	0.374***
	(8.07)	(7.15)	(9.15)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	684917	684917	684917

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 48: Analysis of Pickup and Delivery Stop Characteristics for ORD before 2009, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	-0.00625	0.00923	-0.00339
	(-0.50)	(1.33)	(-0.19)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	1322453	1322453	1322453

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 49: Analysis of Pickup and Delivery Stop Characteristics for ORD in or after 2009, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.101**	0.0391*	0.117**
	(2.80)	(2.26)	(2.62)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Observations	383765	383764	383765

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

76. I next addressed the question whether black drivers in these stations were more likely than white drivers to deliver or pick up packages in a census tract that was majority black or heavily majority black. Table 50 shows the results of a logistic regression, where the coefficients are reported in the form of odds ratios. As can be seen in Table 50, the odds that a black driver from the DPA station would deliver or pick up a package in a census tract that was more than 50% black were over 28 times as high as were the corresponding odds for a white driver, after year, seniority, and regular or casual status were taken into account. This difference was statistically significant at more than 4 standard deviations. The odds that a black driver from the JOT station would deliver or pick up a package in a census tract that was more than 50% black were 10 times as high as were the corresponding odds for a white driver, and this difference was statistically significant at more than 6 standard deviations. Table 50 further shows that there was no statistically significant difference in the odds of a white or black driver delivering or picking up a package in a census tract that was majority black at the ORD station in 2008 or earlier, but that a black driver at the ORD station in 2009 or later had over 6 times the odds of a white driver of picking up or delivering a package in a neighborhood that was majority black. This discrepancy was statistically significant at more than 3 standard deviations.

Table 50: Probability of Stops being in 50+ percent black neighborhoods, 2000 Census Tracts

	(1) DPA	(2) JOT	(3) ORD pre-2009	(4) ORD 2009+
Black Driver	28.39***	9.999***	0.778	6.109***
	(4.93)	(6.94)	(-0.44)	(3.76)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	1901125	685524	1322458	385117

Exponentiated coefficients; *t* statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

77. Table 51 shows, for each of the three stations, the odds ratios of a black vs a white driver delivering or picking up a package in a census tract that is more than 70% black, after taking seniority, casual or regular status, and year into account. The odds that a black driver at the DPA station would deliver or pick up a package in a heavily (70% or more) black neighborhood were 41.7 times as high as for a white driver. This difference was statistically significant at more than 3 standard deviations. The odds that a black driver at the JOT station would deliver or pick up a package in a heavily (70% or more) black neighborhood were 17 times as high as for a white driver. This difference was statistically significant at more than 8 standard deviations. The odds that a black driver at the ORD station in 2009 or later would deliver or pick up a package in a heavily (70% or more) black neighborhood were 6 times as high as for a white driver. This difference was statistically significant at more than 3 standard deviations.

Table 51: Probability of Stops in 70+ percent black neighborhoods, 2000 Census Tracts

	(1) DPA	(2) JOT	(3) ORD pre-2009	(4) ORD 2009+
Black Driver	41.65***	16.94***	0.686	6.096***
	(3.75)	(8.28)	(-0.53)	(3.78)
Year	Yes	Yes	Yes	Yes
Seniority	Yes	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes	No
Observations	1901125	685524	1322458	385117

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

78. Next, I used 2000 census tract characteristics to analyze the average neighborhood characteristics at each pickup and delivery location over the course of the route on each date for which we have information. Tables 52, 53, 54, and 55 show the results of regressions of average route neighborhood characteristics on the race of the driver, and where seniority, regular or casual status, and year are controlled. If we compare these results with those reported in Tables 11, 12, 13, and 14 using 2010 census tract geography, we see that the results are very similar for all three stations. In both stations DPA and JOT and in station ORD in 2009 or later, black drivers generally drove routes through neighborhoods that had a higher percent black residents, a higher percent poor residents, and a higher percent nonwhite residents than did white drivers.

Table 52: Analysis of Route-Day Characteristics for DPA, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0308**	0.00842*	0.0526***
	(2.76)	(2.01)	(3.72)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	43526	43526	43526

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 53: Analysis of Route-Day Characteristics for JOT, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.318***	0.0742***	0.341***
	(8.41)	(7.14)	(9.21)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	13619	13619	13619

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 54: Analysis of Route-Day Characteristics for ORD before 2009, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	-0.00730	0.00748	-0.0103
	(-0.67)	(1.24)	(-0.66)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	42005	42005	42005

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 55: Analysis of Route-Day Characteristics for ORD in or after 2009, 2000 Census Tracts

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.108***	0.0424**	0.125**
	(3.42)	(2.86)	(3.28)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Observations	22827	22827	22827

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

79. Next, I examined the probability of a black or white driver driving a route that over the course of the day was on average either more than 50% black or more than 70% black using 2000 census tract neighborhood characteristics. Table 56 shows the results from these analyses for station JOT. These results are very similar to those reported in Table 15 using 2010 census tract geography. The odds that a black driver drove routes that on average were more than 50% black or more than 70% black were much higher than were the odds that a white driver drove these routes.

Table 56: Probability of Route Stops being on Average in Majority Black Neighborhoods in Station JOT, 2000 Census Tracts

	(1) >=50%	(2) >=70%
Black Driver	13.72***	23.97***
	(5.93)	(6.27)
Year	Yes	Yes
Seniority	Yes	Yes
Regular/Casual	Yes	Yes
Observations	13626	13626

Exponentiated coefficients; t statistics in parentheses

Coefficients are reported as odds ratios.

A 'Yes' means that the indicated variable was included in the model.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

80. Lastly, as a robustness check on my analysis of average route characteristics, I re-computed these average characteristics quality measures when available as before but now also using interpolated geography measures when plausible interpolations were obtainable. The results of these analyses are in Tables 57, 58, 59, and 60. As is readily apparent, the coefficients in this augmented regressions are very similar to the coefficients presented in Tables 52, 53, 54, and 55 for the regressions that limit the calculations to stops that have quality addresses.

Table 57: Analysis of Route-Day Characteristics for DPA, 2000 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.0311**	0.00842*	0.0526***
	(2.77)	(2.01)	(3.71)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	43526	43526	43526

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 58: Analysis of Route-Day Characteristics for JOT, 2000 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.318***	0.0743***	0.341***
	(8.43)	(7.13)	(9.23)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	13619	13619	13619

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 59: Analysis of Route-Day Characteristics for ORD before 2009, 2000 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	-0.00742	0.00757	-0.0103
	(-0.69)	(1.25)	(-0.67)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Regular/Casual	Yes	Yes	Yes
Observations	42005	42005	42005

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 60: Analysis of Route-Day Characteristics for ORD in or after 2009, 2000 Census Tracts, including Interpolated Measures

	(1) Percent Black	(2) Percent Poor	(3) Percent Non-White
Black Driver	0.108***	0.0419**	0.125**
	(3.43)	(2.87)	(3.27)
Year	Yes	Yes	Yes
Seniority	Yes	Yes	Yes
Observations	22827	22827	22827

t statistics in parentheses

A 'Yes' means the indicated variable was included in the analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

7 Appendices

81. I also include as appendices to this report my Curriculum Vitae, a list of cases in which I have testified during the last four years, and the hourly rate that I am currently being compensated at for my work in this case.

82. I also include as appendices to this report my computer code and log files as well as copies of the input data files that I used to run the computer code.

83. The names of class members are included as an appendix to this report. A supplementary spreadsheet (DHL Class Listing with Staffing and Seniority Months.xls) is included along with the program code, log files, and input data. This spreadsheet shows where each of the class members was working by time period according to the bid sheets, the staffing sheets, and the seniority lists.

Cases in which I Have Testified or been Deposed during the Past Four Years

- Gulino et al. v. the Board of Education of the City School District of the City of New York, Case No. 96 Civ. 8414.
- The State of Wisconsin v. Abbott Laboratories et al. Case No. 04 CV 1709.
- The State of Wisconsin v. Novartis. Case No. 04 CV 1709.
- The State of Wisconsin v. Aventis. Case No. 04 CV 1709.
- Portis et al. v. the City of Chicago, Case No. 02 C 3139.
- Conley et al. v. Nestle. Case No. 09 C 5996.

Billing Rate

- My current billing rate is $555 per hour.

Curriculum Vitae

- My Curriculum Vitae begins on the next page.

Names of Class Members

Table 61: Names of Class Members

Akenten, Maxwell	Green, Nicholas	McCall, Anthony	Stewart, Loron
Allen, Calvin	Green-Riley, Benita	McNeal Jr., Aldrich	Street, Toxey
Anderson Sr., Darrell	Haven, Johann	McNeely, Sandra	Studstill, Alonzo
Austin, Dennis	Hayes, Jimmie	Medley, Edgar	Thomas, Paul
Azor, Phillip	Hill, Felicia	Miller, Erskine	Thompson, Randy
Bailey, Reginard	Hopkins, Phillip	Murphy, Alonzo	Thornton, Jerry
Bell, Denise	Huggins, Lisa	Noys, Antonio	Turner, Michael
Bonslater-Burnett, Alma	Jackson, Demario	Oliver, Landers	Washington, Sharee
Brantley, Andrea	Jackson, Jamil	Pendleton, Willie	Wetherspoon Jr., Ricky
Brisco, Kenneth	Jackson, Nathaniel	Perry, Angela	White, George
Britton, Thomas	James, David	Price, Timothy	Williams Jr., Arthur
Brown, Derwin	Johnson, Christopher	Quarles, Chris	Williams, Sandra
Buffkin, Shuray	Johnson, JC	Reams, Lewis	Willis, Sheldon
Calhoun, Anthony	Johnson, Michael	Redd, Willie	Young, Jamaine
Cheeks, Donald	Jones, Joseph	Robertson, Allan	
Cummings, Kevin	Jordan, Anthony	Robinson, Aubrey	
Dean, Oliver	Kelly, Allan	Robinson, Ryan	
Edwards, Melvin	Kelly, Reginald	Robinson, Sharon	
Ellis, John	Lester, Miranda	Rochelle Sr., Lawon Dale	
Fefee, David	Lewis, Leslie	Scott, John Royce	
Fields II, Percy	Lowe, Michael	Shields, Millicent	
Ford, Ronnie	Lyons, Robert	Singleton, Renard	
Foster, DeMarco	March, Christopher	Smith, Darrell	
Fulks, Michael	Martin, Charles	Smith, William	
Gilbert Sr., Paul	May, Edward	Stewart, Gregory	